NBI Heating efficiency and δf bootstrap current calculations for QA devices

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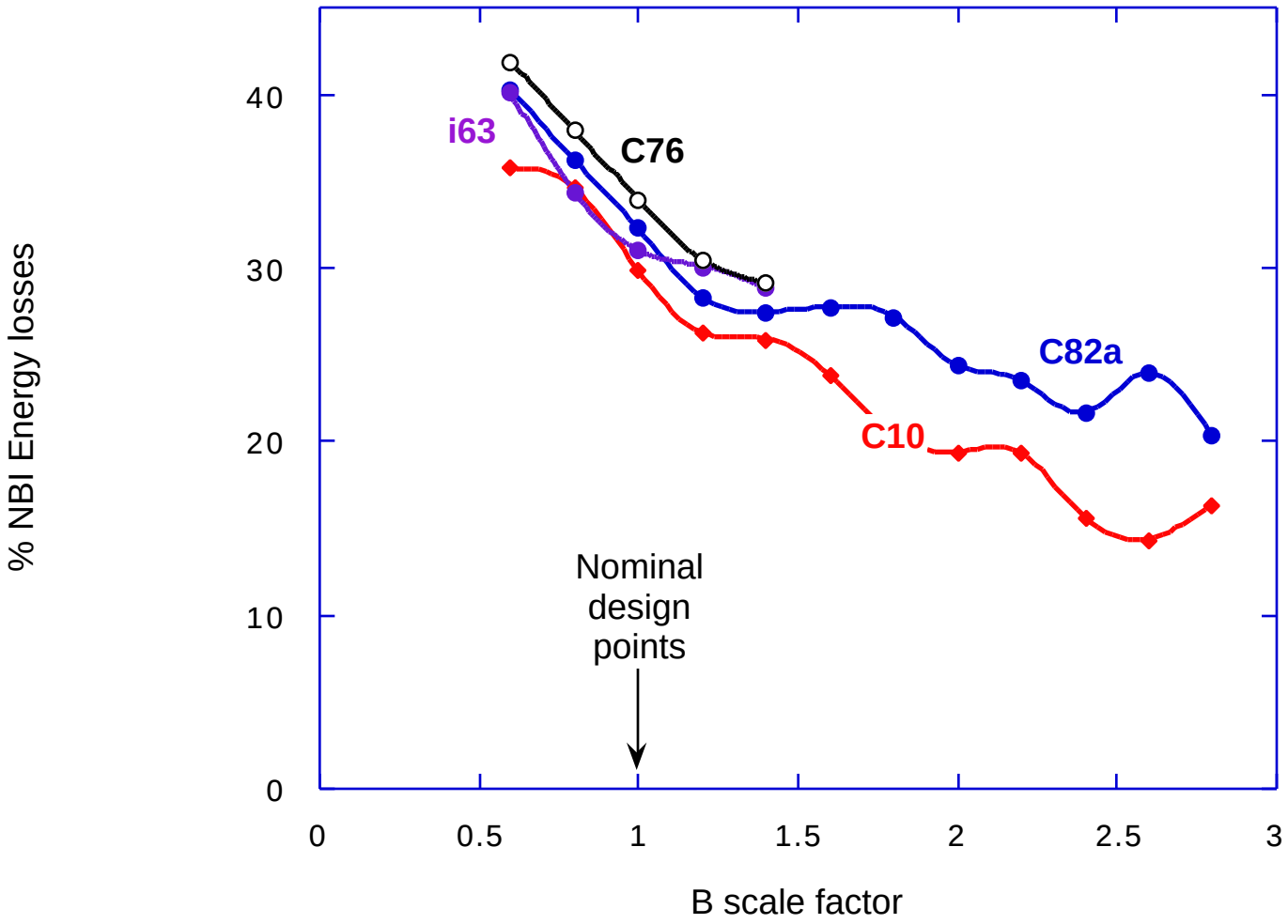
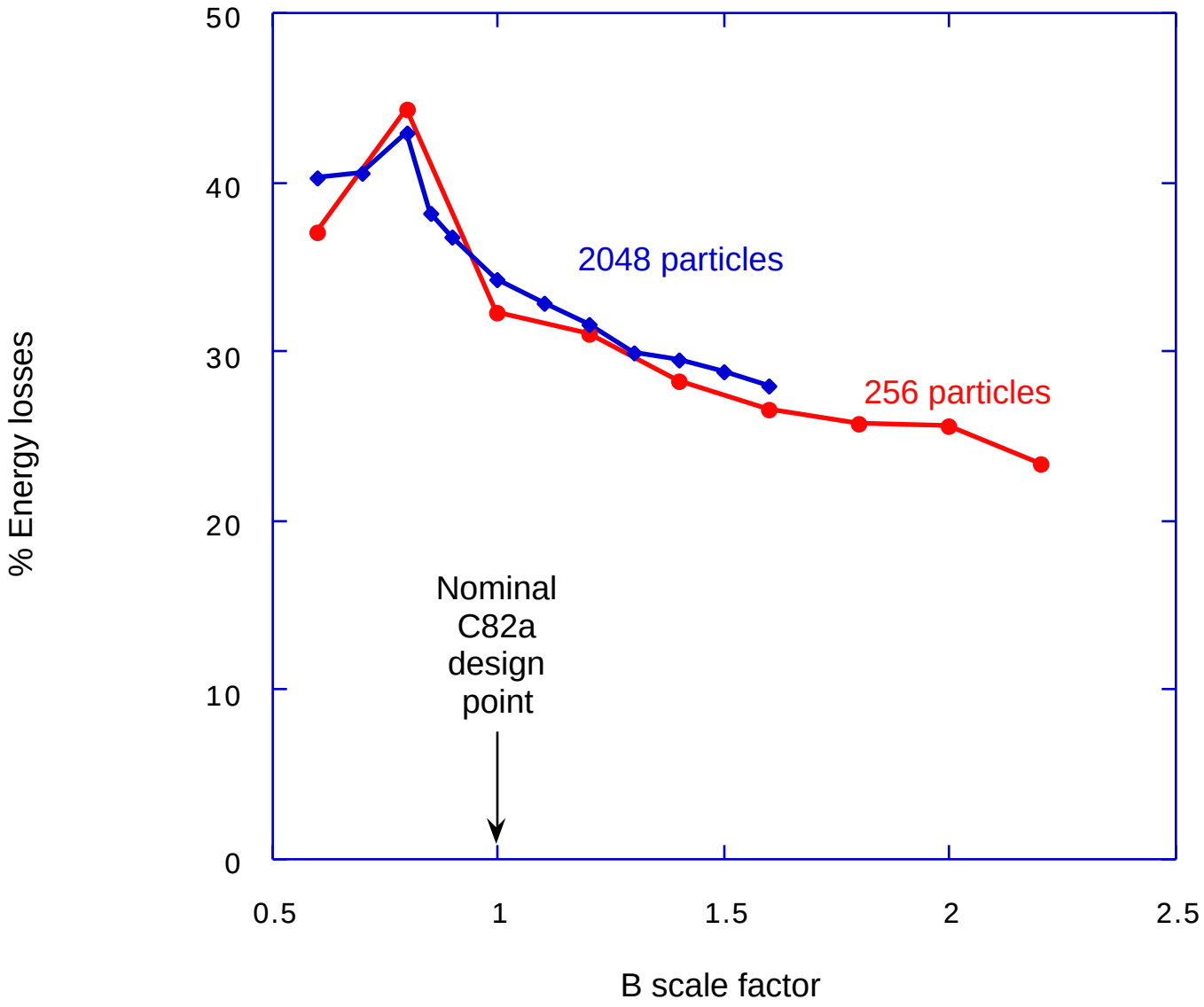
- B dependence of NBI heating efficiency shows structure and deviations from ρ/a scaling which are caused by
  - prompt/stochastic losses
- A δf calculation of bootstrap current has recently been developed based on the method of Boozer and Sasinowski
  - applied to ion currents in QA/QO devices
  - future work will look at electrons and other weighting schemes

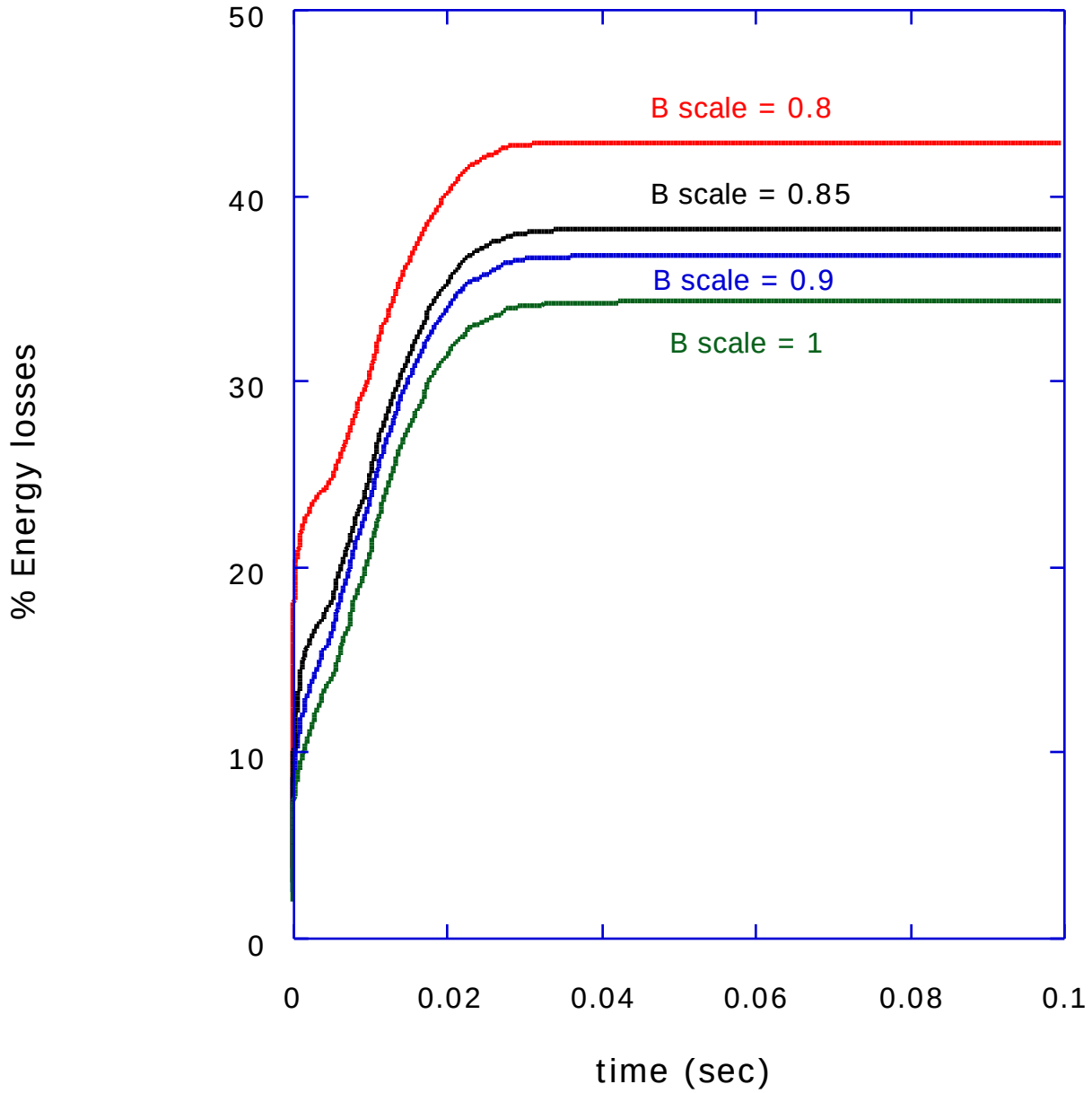
NBI energy losses for a range of QA devices at 40 keV injection energy

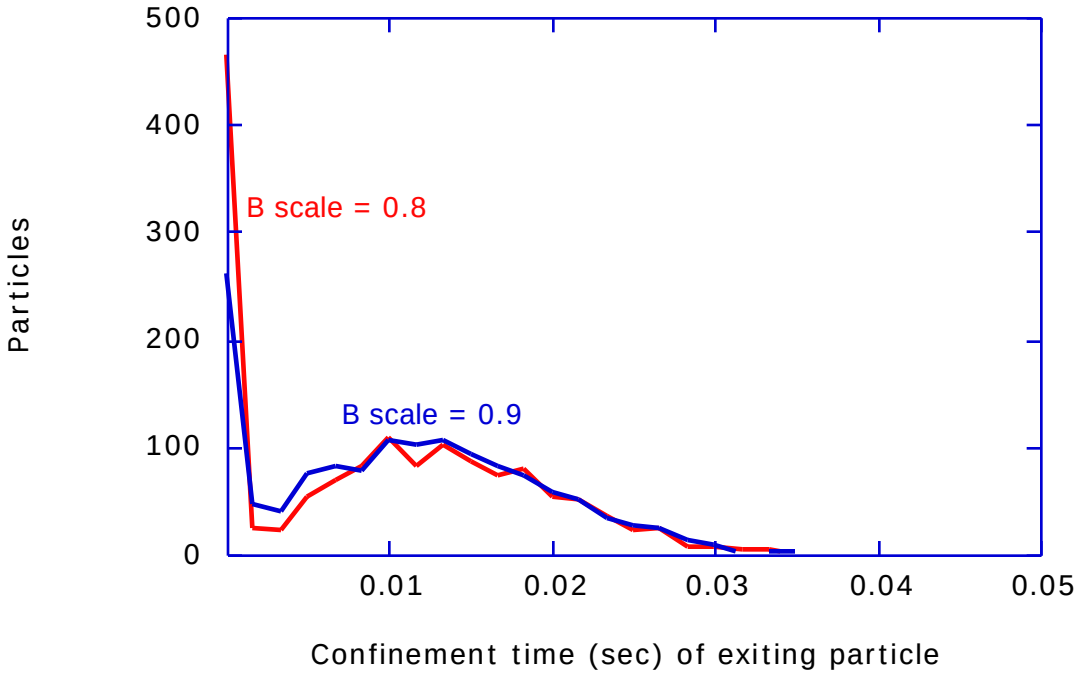


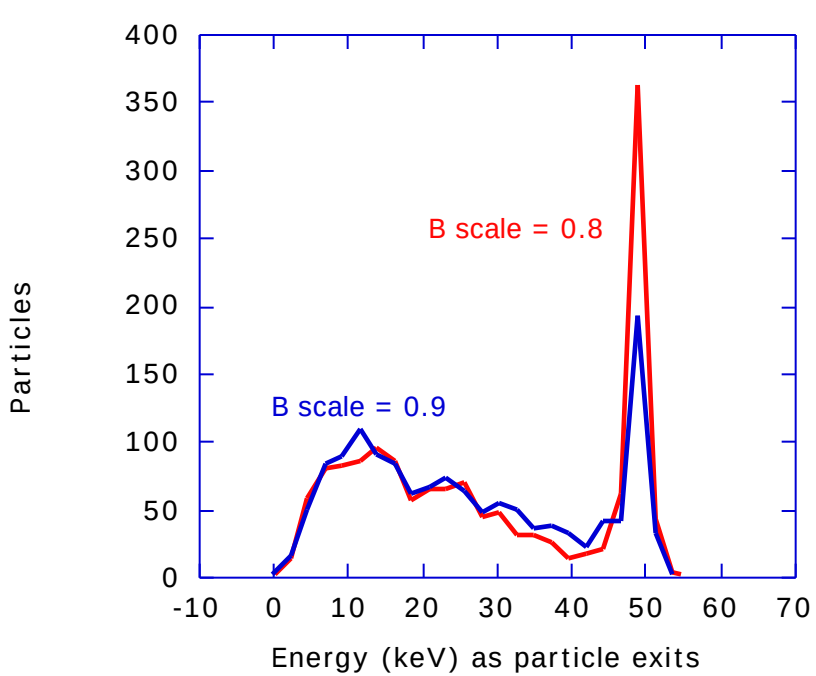
NBI losses in c82a at 50 keV injection energy

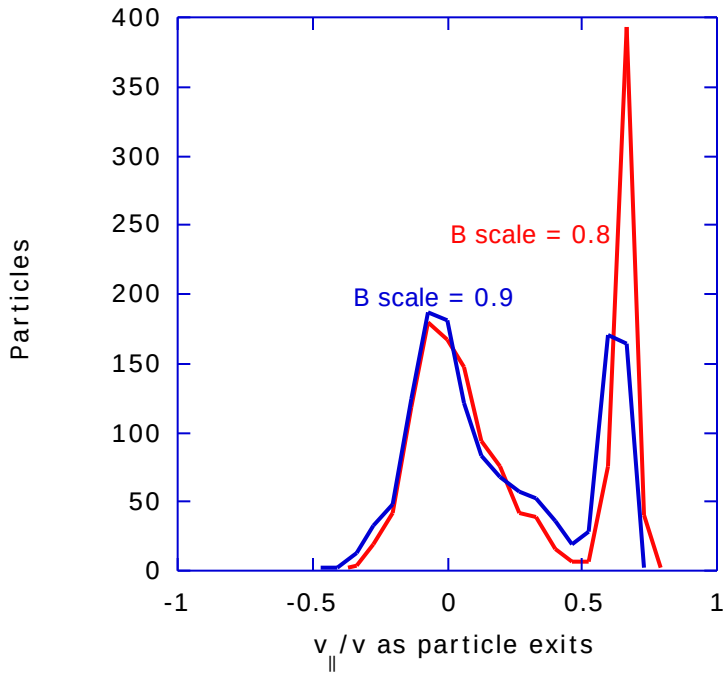


The case at 80% full field shows a higher level of prompt losses than nearby cases:

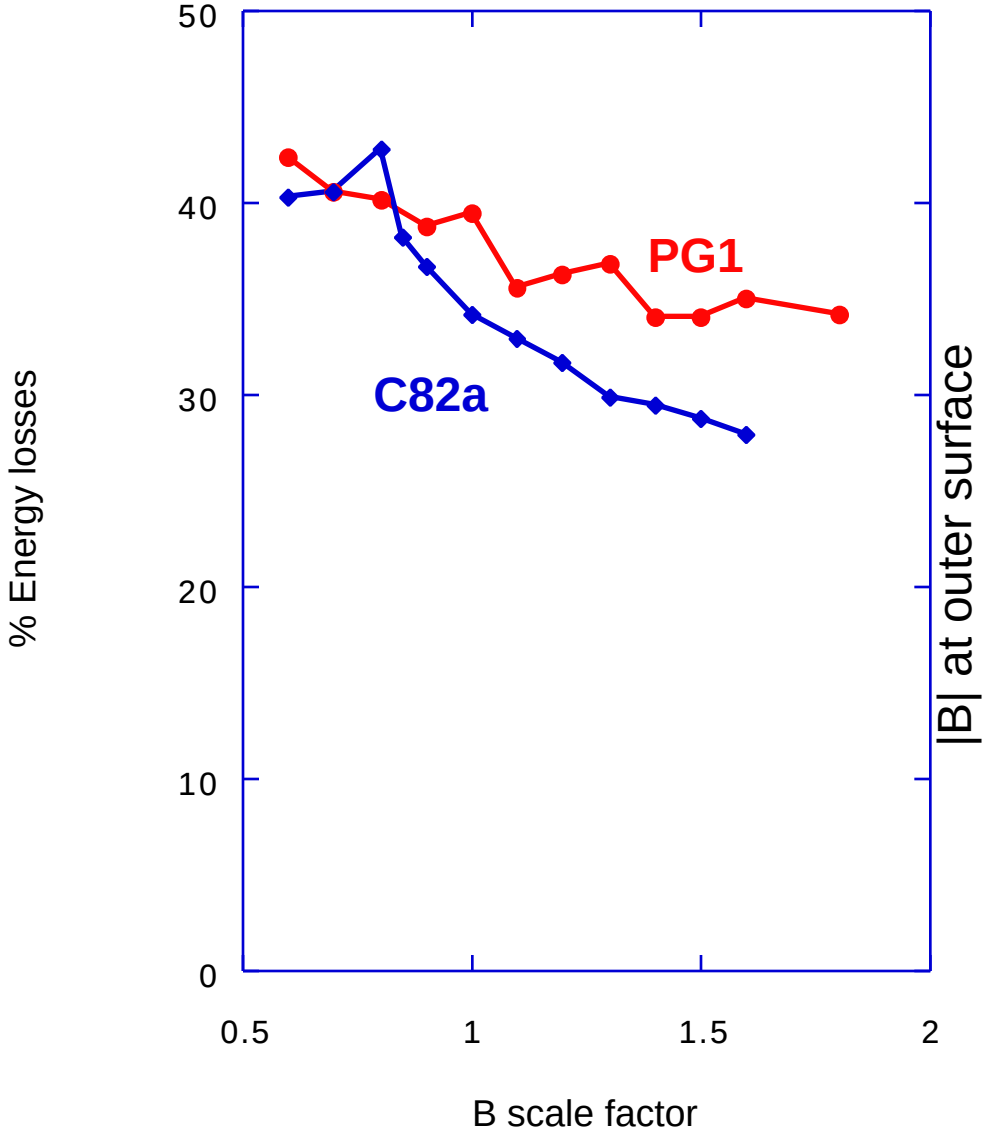


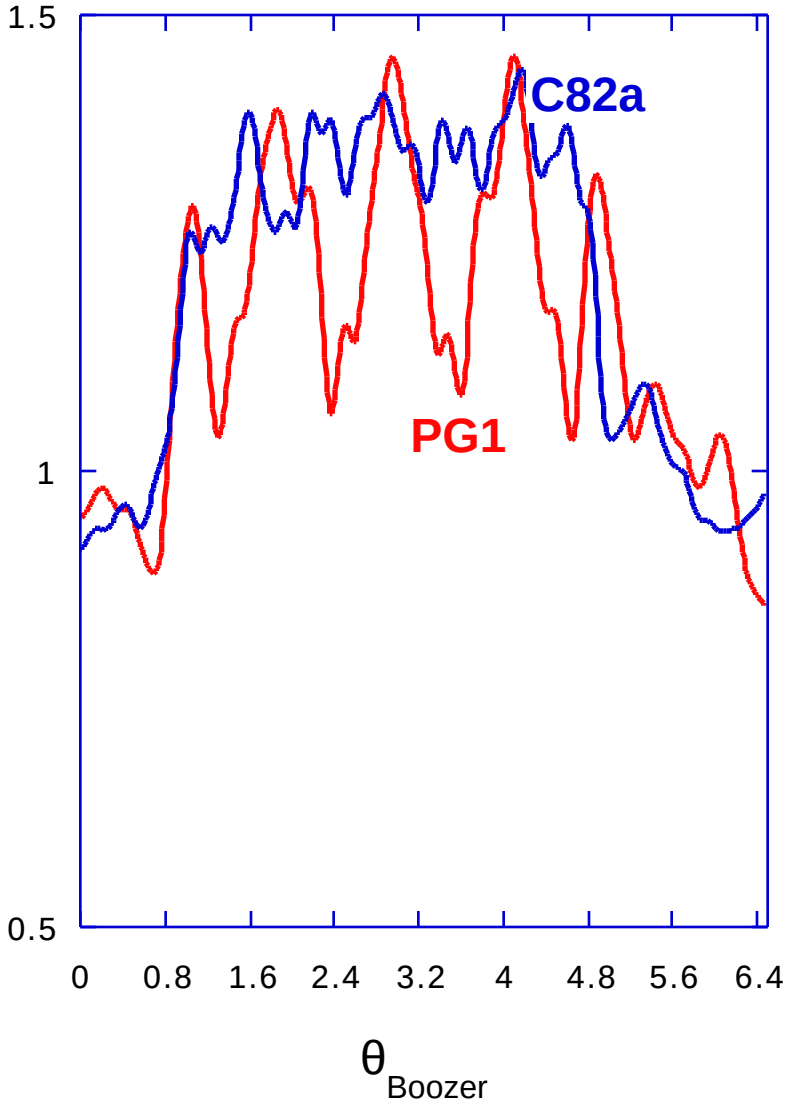

500
400
300
200
100
0
Particles
B scale = 0.8
B scale = 0.9
0.01
0.02
0.03
0.04
0.05
Confinement time (sec) of exiting particle


400
350
300
250
200
150
100
50
0
Particles
B scale = 0.8
B scale = 0.9
-10
0
10
20
30
40
50
60
70
Energy (keV) as particle exits


400
350
300
250
200
150
100
50
0
Particles
B scale = 0.8
B scale = 0.9
-1
-0.5
0
0.5
1
v‖/v as particle exits

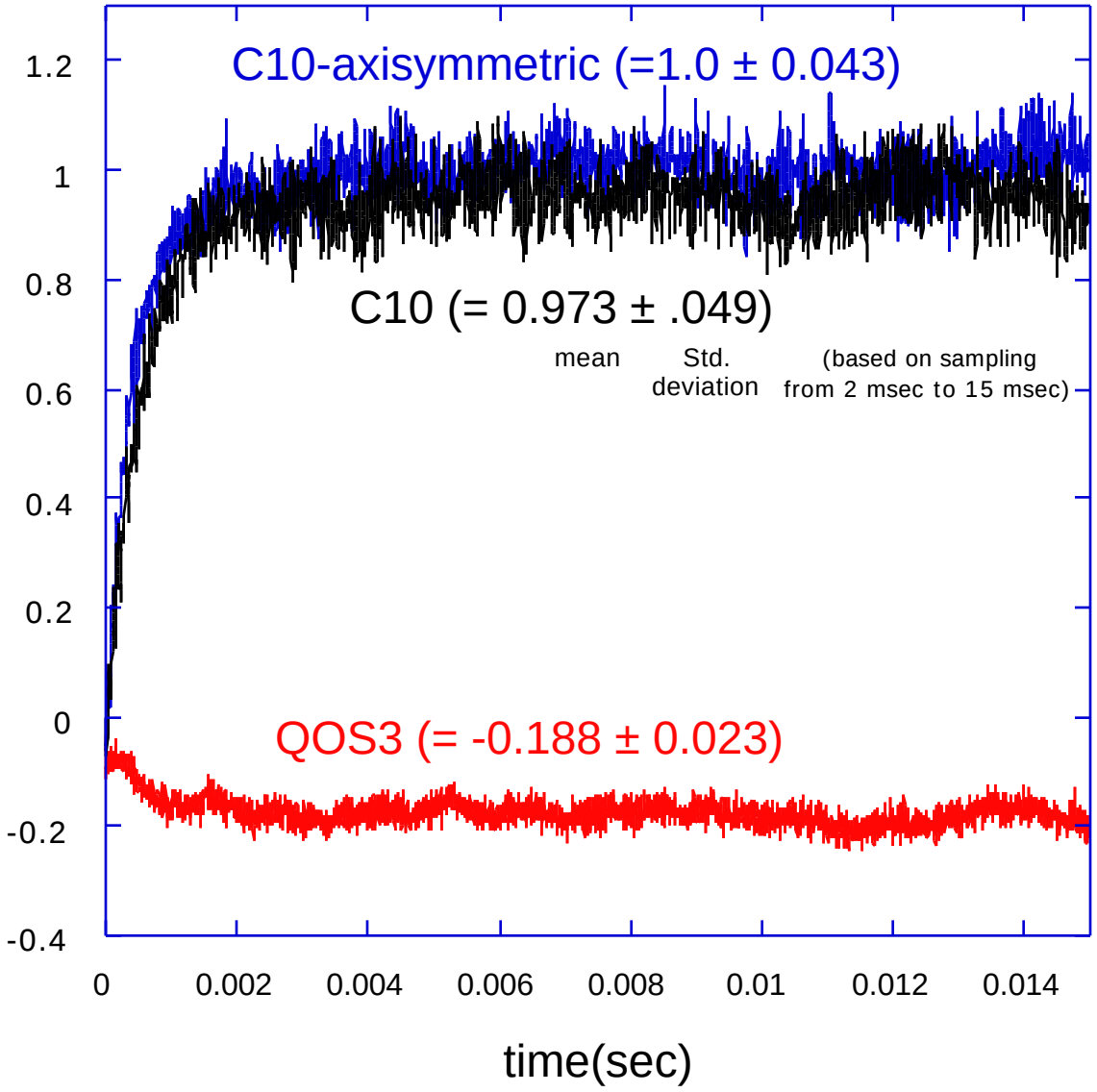
Comparison of C82a and PG1:





f δ bootstrap current calculations show:

- little difference between c10 and its axisymmetric limit
- expected difference in sign and magnitude between c10 and qos3



- ions, τ_i = 0.7msec
- n_0 = 3 x 10^{13}, T_0 = 1 keV
- 4096 particles
- started at “r/a” = 0.5
- removed if $|\delta\psi/\psi_0| > 0.25$
- then reseeded at ψ_0